



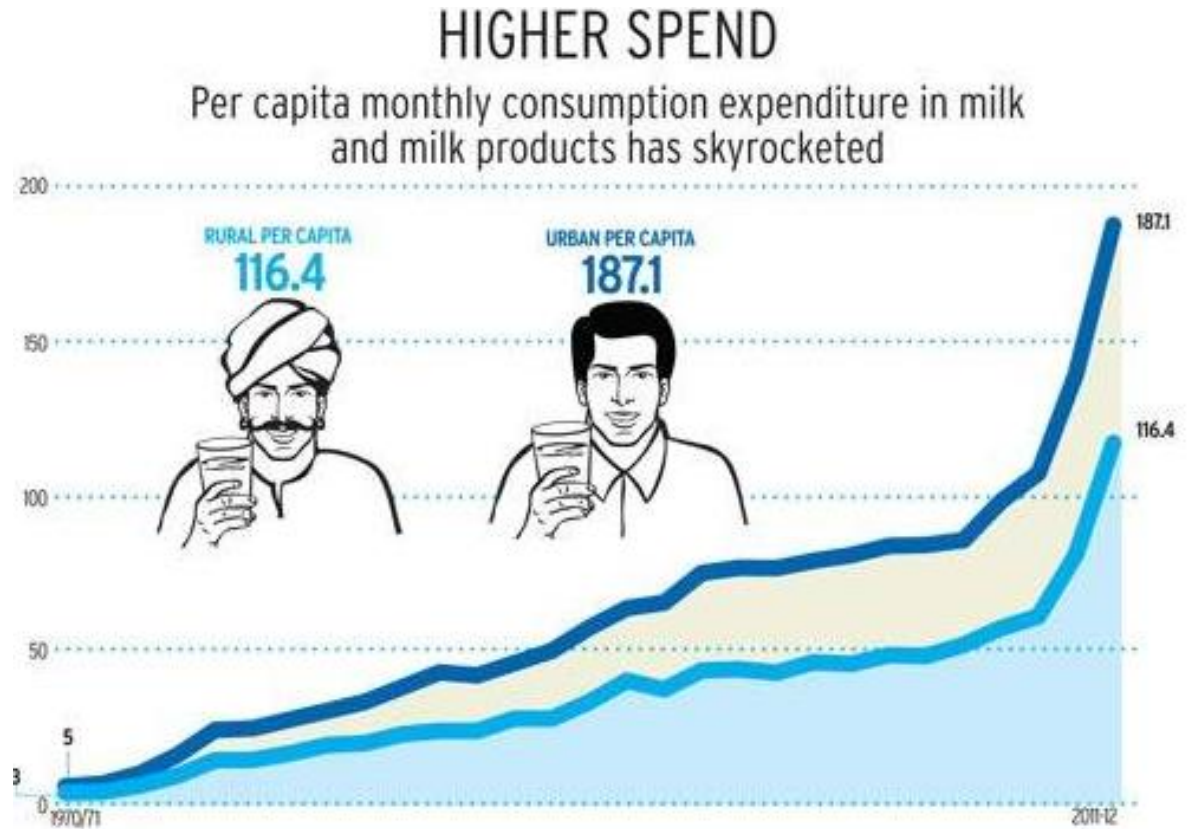
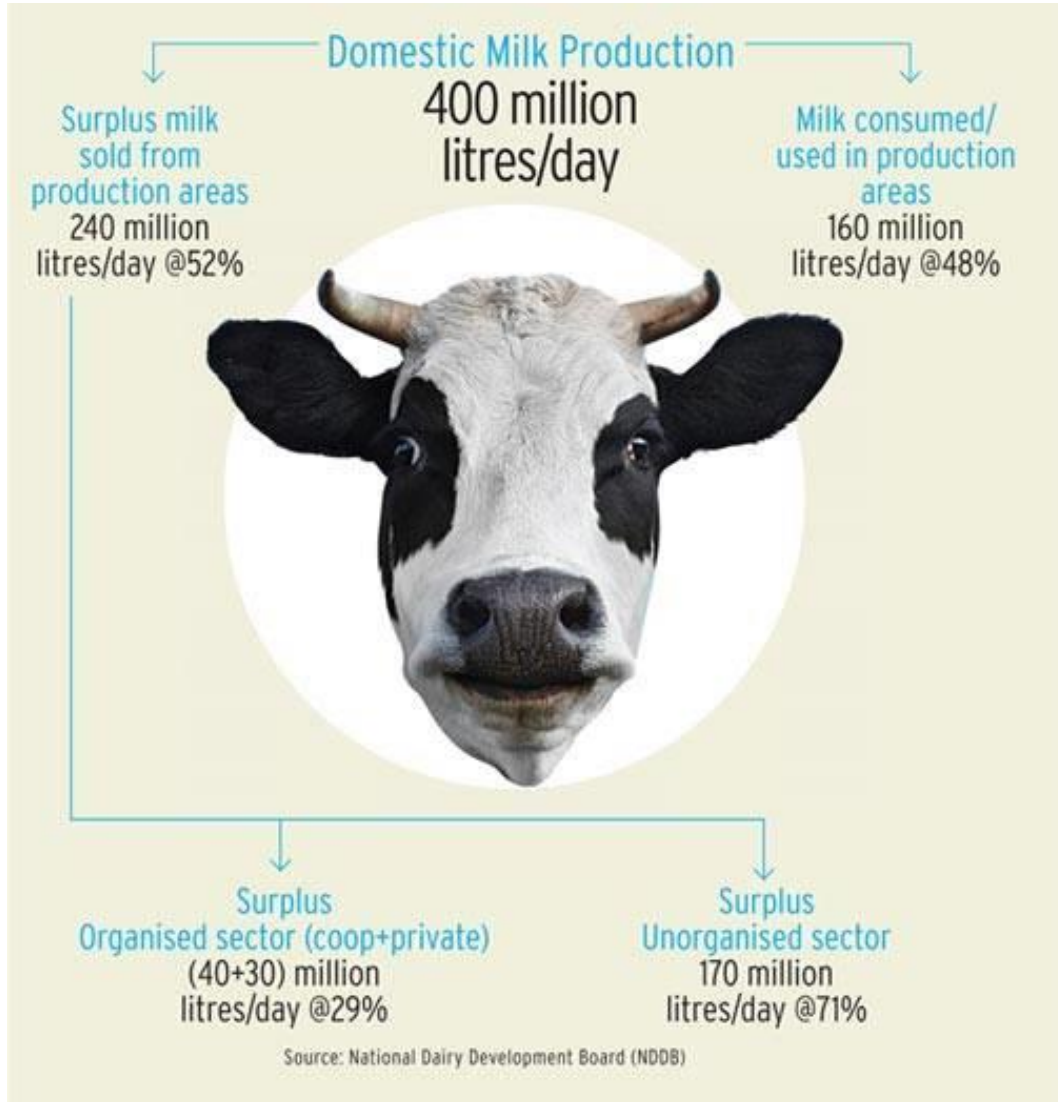
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# Solar Based Refrigeration in Dairy Sector

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Solving Problems in static and portable cold solutions *via*  
Sustainable Energy Sources

# Milk, Milk Everywhere!



# The need for refrigeration: mainly in the procurement section

30% of the milk is wasted in the transit itself

Wastage is mainly due to inefficient and expensive storage and delivery process

Refrigerated transportation has not been implemented at the procurement section, yet: high opex.



Transition to Value added products requires high quality of milk

Majority of the milk is consumed locally in India, unable to meet the International Quality Standards

Increase in the contribution of the farmers to the organized sector of the milk which, currently constitutes only 20% of the entire milk market!

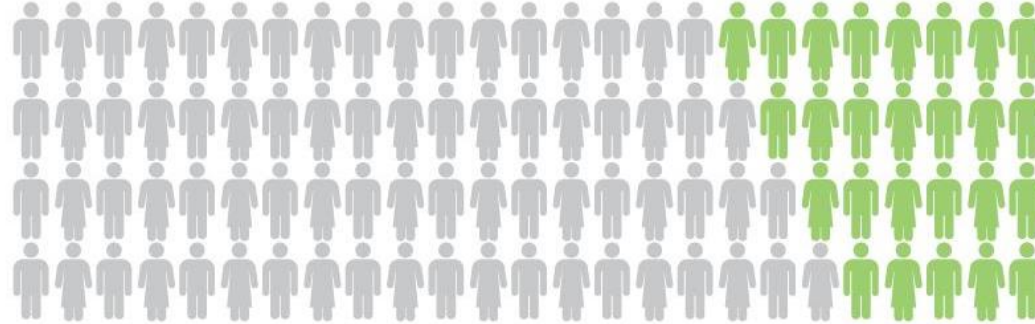
## The Moo Point: The need for solar!

- Most commercial milk refrigeration systems require a dedicated diesel generator, which can double the capital cost and triple the operating cost of such a system.



- Industrial cold storage solutions offered by suppliers to the dairy industry therefore cater to high-volume dairy processors. It only makes sense to install such systems in large milk-producing villages where volume is 2,000L or more per day.
- **Since most Indian dairy farms are small, producing around 300L-500L of milk per day, they find available BMCU options prohibitively expensive.**

# Why are Conventional Refrigeration Techniques not adopted?



**Only about 1% of the entire procurement chain is adept with refrigeration facility: Why?**

- Conventional refrigeration products are not specifically built to facilitate milk processing and are more appropriate for retail level storage, and so they are imperfect substitutes for the BMCUs manufactured by commonly known refrigeration companies.
- Taking the 85% unorganized milk sector, the number of milk producing villages are ~ 500,00 of which the total percentage of villages that properly chill their milk is significantly less.

# Opportunity with Solar Technology

Solar electricity has been freefalling in India: with a cost of about INR 2.44 per kWh



Technological Advancements in DC driven appliances provides the perfect opportunity

**India has cancelled plans to build nearly 14 gigawatts of coal-fired power stations – about the same as the total amount in the UK**

# Case Study: Taking a step further- Story of Promethian Power Systems



**Solar Add-On**



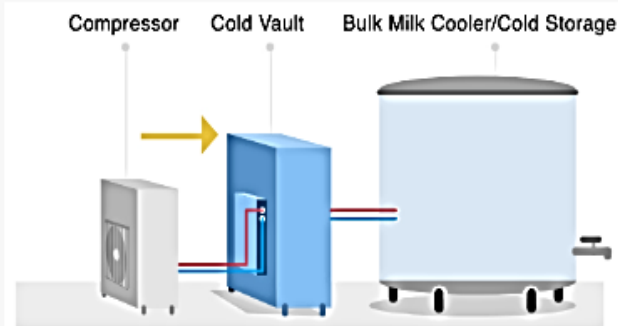
**Rapid Milk Chilling Units: Already in use by milk federations and private milk organizations**

Their energy distribution box minimizes energy consumption and optimizes the use of available solar and grid power.

# Case Study: Retrofitted Thermal Solutions for power outages in Milk Segment: Story of Inficold

1

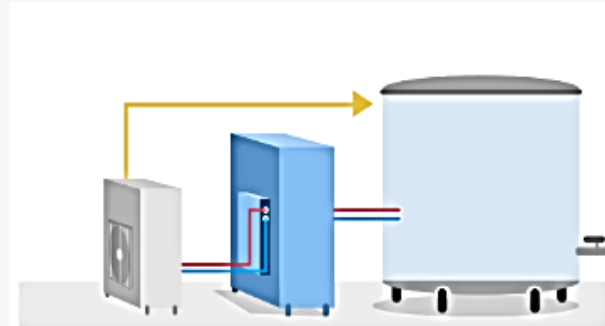
## Charging Mode



When cooling is not required and electricity is available, compressor uses electricity to generate cooling and CV stores it in a phase change material for cooling later.

2

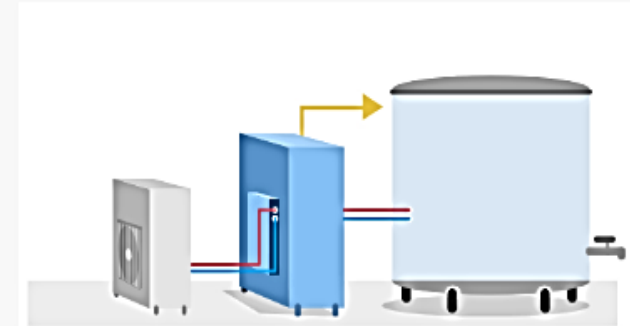
## Direct Mode



When cooling is required and electricity is available, compressor bypasses ColdVault to provide cooling directly for immediate use

3

## Discharging Mode



When cooling is required but electricity is not available, ColdVault provides cooling from the storage

Energy Efficient cooling solutions to tap the problem of power outages in procurement sections

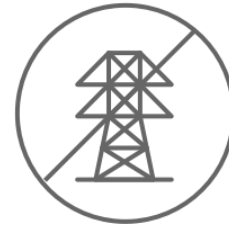


# Challenges with Solar energy and how to overcome them

- Solar technology can be a smart technology, if **implemented properly**. It is not a viable option to have standpoints of solar-run BMCs as, mostly BMCs are set up in producing areas that has a production capacity of 2000 liters per day, and most variably, such villages are electrified.
- The milking cycle is not in sync with the solar-cycle, which causes complications. Thus, solar refrigeration lends itself to be bulky, expensive and inefficient till date. **(Need for thermal storage arises here)**
- Technically, tapping solar energy provides a DC current. Conversion of DC to AC involves inefficiencies and using DC for heavy appliances has not been in full scale, yet.



## How are we doing our part?



**Modular**



**Off-Grid**

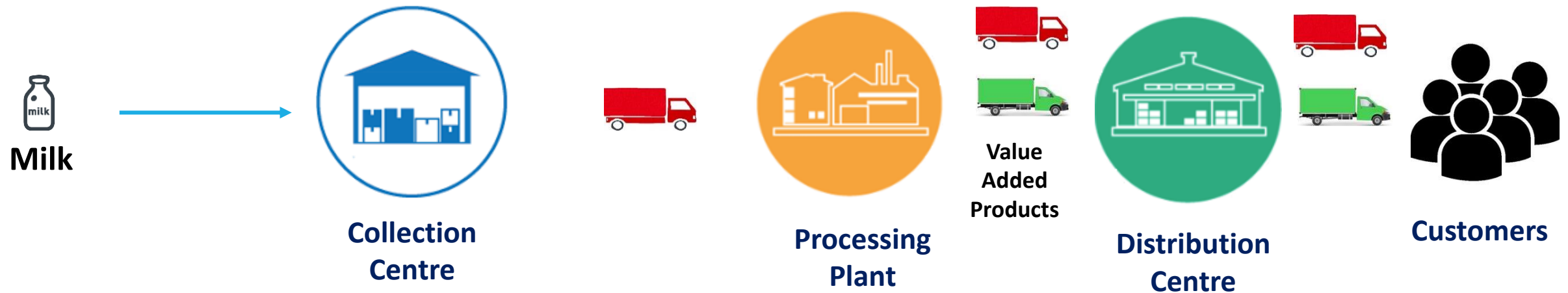
**No Perishables are  
perishables  
anymore!**

**Farmer Empowerment**



Tan90 is redefining the refrigerated storage by incorporating **modularity**, **longer retention time**, and **off-grid solutions** that enables **primary producers** with better return on investments.

# Bringing Cold Refrigerated Transportation in both procurement and Retail Section



## For organized dairy segment:

- Capacity 10.5 LLPD (2018)
- Growth Rate 22-24% CAGR
- Share of segment: 25% of industry

## Challenges & Issues

- Assured milk availability & quality
- International SMP prices
- Logistics for procurement

 No cold chain

 Cold chain in place

# Towards a sustainable Refrigerated Transport

**Box that can be stacked**  
(Beta Tested and being Commercialized)

For the retail end

- Patent pending technology to cool the milk at the can level in each collection center.

**CAPACITY:** 70 liters

**MATERIAL USED:** FRP, Rodent and Biofilm proof

**COOLING MECHANISM:** Eutectic

**LIFE OF BOX:** 5 years

**LIFE OF PANELS:** 3 years

**DIMENSIONS:**

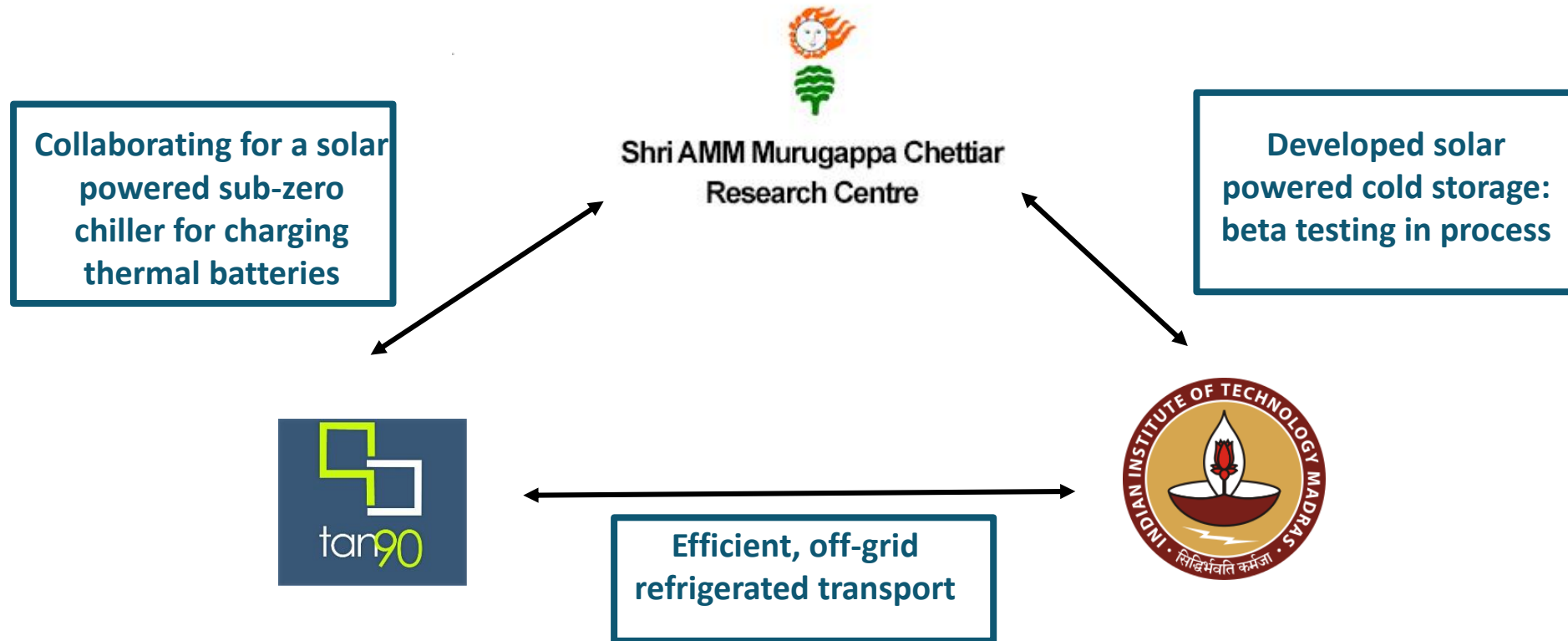
**BOX:** 580 x 400 x 320 mm

**PANEL:** 350 x 230 x 30 mm

**MODE OF CARRIAGE/ USE:** Stackable up to 8 high in LCV



# Leveraging Sustainable Energy for Refrigerated Transport



**To Help Cut Farm Waste, IITM Startup Develops Solar-powered Cold Storage**

*The Economic Times 14<sup>th</sup> Nov' 2018*

**Thank You**